Statement of Basis

Title V Air Quality Permit

NorthWestern Energy
Aberdeen, South Dakota

South Dakota Department of Environment and Natural Resources

1.0 Background

On September 26, 1996, the South Dakota Department of Environment and Natural Resources (DENR) issued NorthWestern Energy formerly Northwestern Public Service Company its initial Title V permit.

On March 12, 2004, DENR renewed NorthWestern Energy's Title V permit.

On May 27, 2005, DENR issued a modification to NorthWestern Energy to revise the periodic monitoring requirements.

On November 26, 2008, DENR received a notice of intent and application to renew its Title V permit from NorthWestern Energy for its facility located in Faulkton, South Dakota.

The primary Source Industrial Code (SIC) listed on the application for this facility was 4911 - establishments engaged in the generation, transmission, and/or distribution of electric energy for sale. NorthWestern's Aberdeen plant provides peak electrical generation. The facility is on call to operate, as needed, the combustion turbine. The combustion turbine operates with distillate fuel as the fuel source.

2.0 Operational Description

The following is list of equipment derived from the application:

- Combustion Turbine #1 – 1978 General Electric combustion turbine, model number PG53441/US50001/245181. The combustion turbine is fired on distillate oil. The combustion turbine has a maximum design operating rate of 417 million Btus per hour heat input or 28,800 kilowatts heat output.

- Tank #1 – A 1977 999,950 gallon vertical aboveground storage tank. Distillate oil is stored in the tank.

3.0 Applicable Requirements

3.1 New Source Performance Standards

The department reviewed the New Source Performance Standards (NSPS) and determined that several NSPS need to be reviewed further to determine if they are applicable.

3.1.1 ARSD 74:36:07:18 – 40 CFR, Part 60, Subpart GG

The department reviewed 40 CFR Part 60.330, Subpart GG - Standards of Performance for Stationary Gas Turbines - for applicability. Subpart GG is applicable to owners and operators of stationary gas turbines that:

(a) Have a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel fired.

(b) Commence construction, modification, or reconstruction after October 3, 1977,

The heat input value is based on the heat output value of 28,800 kilowatts (provided in the application), the conversion factor from kilowatts to Btus per hour (3,413 Btus per hour – kilowatt), and the engine efficiency of 23.6%. The following equation was used by the department to convert from heat output to heat input:

Heat input = (Heat output x conversion factor / engine efficiency) / 1,000,000 Btus/MMBtus
= (28,800 kilowatts x 3,413 Btus/hour-kilowatt / 0.236) / 1,000,000 Btus/MMBtus
= 417 MMBtus/hour

According to the listed heat output value and the calculated heat input value of 417 MMBTUs/hr, , the combustion turbine is subject to this subpart. However, the application states that NorthWestern contracted the purchase of the combustion turbine in 1976. A permit to install the combustion turbine was issued in April, 1977, prior to the October 3, 1977 applicability date. Therefore, this subpart is not applicable to the combustion turbine.

3.1.2 ARSD 74:36:07:89 – 40 CFR, Part 60, Subpart KKKK -

Subpart KKKK- Standards of Performance for Stationary Gas Turbines - is applicable to owners and operators of stationary gas turbines that:

(a) Have a heat input at peak load equal to or greater than 10.7 gigajoules (10 MMBtu) per hour, based on the higher heating value of the fuel,

(b) commenced construction, modification, or reconstruction after February 18, 2005,

(c) Stationary combustion turbines regulated under this subpart are exempt from the requirements of subpart GG of this part.

According to the listed heat output value and the calculated heat input value of 417 MM Btus/hr, the combustion turbine is subject to this subpart. However, the application states that NorthWestern contracted the purchase of the combustion turbine in 1976. A permit to install the combustion turbine was issued in April, 1977, prior to the February 18, 2005 applicability date.. Therefore, subpart KKK is not applicable.

3.1.3 ARSD 74:36:07:88 – 40 CFR, Part 60, Subpart Kb -

The department determined that 40 CFR, Part 60, Subpart Kb may be applicable. Subpart Kb - Standards of Performance for storage vessels of petroleum liquids constructed after June 11, 1973, and before May 19, 1978 – is applicable to each storage vessel for which:

1. Construction, reconstruction, or modification commenced after June 11, 1973 and before May 19, 1978; and
2. The tank has a capacity greater than or equal to 151,412 liters (40,000 gallons) that is used to store volatile organic liquids.

Northwestern Energy started construction of the storage tank in June 1977, and the storage capacity of the distillate fuel storage tank is 3,785,222 liters (999,950 gallons), which is greater than 151,412 liters (40,000 gallons). Therefore, this subpart is applicable to the storage tank. However, because NorthWestern Energy is storing distillate oil in the tank, which has a maximum true vapor pressure of 0.0048 pounds per square inch absolute (0.04 kilopascals) and does not meet the definition of a volatile organic liquid, the tank is not subject to the standards for volatile organic compounds (40 CFR § 60.112) and is not subject to the monitoring of operations (40 CFR § 60.115(d)(1)). Even though the tank is applicable to the standard, Northwestern Energy does not have to meet any of the requirements.

The tank is not required to meet any requirements of Subpart Kb and the potential emissions from the tank are less than two tons per year. Therefore, the tank is considered an insignificant activity (ARSD 74:36:05:04:01(7)) and does not need to be included into the permit.

3.2 New Source Review (NSR)

The ARSD 74:36:10:01 notes that New Source Review (NSR) regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. NorthWestern Energy is located in Aberdeen, South Dakota, which is in attainment for all the pollutants regulated under the Clean Air Act. Therefore, NorthWestern Energy is not applicable to NSR review.

3.3 Prevention of Significant Deterioration (PSD)

Any stationary source which constructed or modified after August 7, 1977 and emits or has the potential to emit 250 tons per year or more of any air pollutant is subject to Prevention of Significant Deterioration (PSD) requirements *(ARSD 74:36:09 – 40 C.F.R. Part 52.21(b)(1)).* Any stationary source which emits, or has the potential to emit, 100 tons per year or more of any air pollutant and is subject to one of the 28 named PSD source categories is subject to PSD requirements *(ARSD 74:36:09 – 40 C.F.R. Part 52.21(b)(1)).*

NorthWestern Energy is not one of the 28 named PSD source categories but does have potential sulfur dioxide and nitrogen oxide emissions greater than 250 tons per year. Therefore,

NorthWestern Energy is considered a major source under the PSD program. Because NorthWestern Energy started construction of the combustion turbine in June 1977, prior to the August 7, 1977 applicability date, NorthWestern Energy has not been required to obtain a PSD permit. However, any modification that occurs at this facility must be reviewed to determine if it is considered a major modification under the PSD program.
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3.3.1 Emission Factors

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) and Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017) documents, the applicant's application, or other methods to determine potential air emissions.

3.3.1-1 Combustion Turbines

The emission factors for specific pollutants for combustion turbines are derived from AP-42 – Fifth Edition, 3.1, 4/00 and AP42- Fifth Edition, 3.1, 10/96.

Distillate Oil (10/96)

The 4/00 version of AP42 notes the particulate emission factors were for combustion turbines with water injection. Since this combustion turbine does not use water injection, the previous AP42 document was used to derive the particulate emission factors.

TSP = 0.061 pounds per million Btus
PM10 = 0.061 pounds per million Btus

Distillate Oil (4/00)

SO2 = 1.01 (S) pounds per million Btus
Where "S" equals the sulfur content of distillate oil. The application states low sulfur distillate oil would be used, which contains less than 0.26 percent.
= (1.01) x (0.26)
= 0.27 pounds per million Btus
NOx = 0.880 pounds per million Btus
VOC = 0.00041 pounds per million Btus
CO = 0.0033 pounds per million Btus
HAPs

1,3-Butadiene	= 4.30E-07 pounds per million Btus
Benzene	= 1.20E-05 pounds per million Btus
Formaldehyde	= 7.10E-04 pounds per million Btus
Napthalene	= 1.30E-06 pounds per million Btus

Polycyclic Organic Matter	= 2.20E-06 pounds per million Btus
Arsenic Compound	= 2.20E-06 pounds per million Btus
Beryllium Compound	= 3.10E-07 pounds per million Btus
Cadmium Compound	= 4.80E-06 pounds per million Btus
Chromium Compound	= 1.10E-05 pounds per million Btus
Lead Compound	= 1.40E-05 pounds per million Btus
Manganese Compound	= 1.40E-05 pounds per million Btus
Mercury Compound	= 1.20E-06 pounds per million Btus
Nickel Compound	= 4.60E-06 pounds per million Btus
Selenium Compound	= 2.50E-05 pounds per million Btus

3.3.1-2 Tanks

The emissions from the tank are derived from a computer software program Tanks 4.0. The dimensions for the tank were estimated based on the known volume of the tank.

The generator has no control devices; therefore potential uncontrolled and controlled emissions are equivalent and will be referred to as potential emissions.

3.3.2 Potential Emission Calculations

Annual potential emissions for each applicable pollutant are calculated from the maximum design capacity listed in the application, assuming the unit operates every hour of every day of the year or 8,760 hours per year, and the emission factors found in Table 3.3.

Equation 3.1 – Heat Input Calculation

$$HeatInput\left[\frac{MMBtus}{hr}\right] = \left(\frac{OperatingR\ ate[kW] \times 3{,}413\left[\frac{Btu}{hr \times kW}\right]}{10^{6}\left[\frac{Btu}{MMBtu}\right] \times 23.6\%}\right)$$

The maximum designed heat input for the generator is 417 MMBtu per hour.

Equation 3.2 – Potential Emission Calculations for Distillate Oil

$$Potential\ \ Emissions\left[\frac{tons}{year}\right] = \left(\frac{Emission\ \ Factor\left[\frac{pounds}{MMBTU}\right] \times Annual\ \ Operations\left[\frac{hr}{year}\right] \times HeatInput\left[\frac{MMBtu}{hr}\right]}{2000\left[\frac{pounds}{tons}\right]}\right)$$

The calculations for the potential emissions are in Appendix A. Table #1 provides a summary of the potential emissions.

Table #1
Potential Emissions

Description	TSP (tons/yr)	PM10 (tons/yr)	SO_2 (tons/yr)	NO_X (tons/yr)	VOC (tons/yr)	HAPs (tons/yr)	CO (tons/yr)
Combustion Turbine	111.3	111.3	474.9	1,607.3	0.8	2.36	6.0
Tank #1	-	-	-	-	0.16	-	-
Total Emissions	**111**	**111**	**475**	**1,607**	**1**	**2**	**6**

The department observed a difference in the potential to emit calculations submitted by NorthWestern Energy from those calculated by the department. The difference involves the heat input value used to calculate the potential emissions. NorthWestern used an engine efficiency of 35%, the department used an efficiency of 23.6% or heat input values of 291.5 MMBtus/hr compared to the department's value of 417 MMBtus/hour.

The HAP total does not need to be broken down into individual HAP components because the total HAPs were less than the individual threshold limit of 10 tons per year.

3.3.3 PSD Applicability

Any stationary source which emits, or has the potential to emit, 250 tons per year or more of any regulated NSR air pollutant is considered a major source and subject to prevention of significant deterioration (PSD) requirements under ARSD 74:36:09 – 40 CFR §52.21(b)(1). Any stationary source which emits or has the potential to emit 100 tons per year or more of any regulated NSR air pollutant and is subject to one of the 28 named PSD source categories is subject to PSD requirements in ARSD 74:36:09 – 40 CFR §52.21(b)(1).

Because Northwestern Energy was constructed in 1976, which is prior to August 7, 1977, Northwestern Energy has not been required to obtain a PSD permit. However, any modification that occurs at this facility must be reviewed to determine if it is considered a major modification under the PSD program. Therefore, NorthWestern Energy is not subject to the PSD requirements.

3.4 National Emission Standards for Hazardous Air Pollutants (NESHAP – Part 61)

Presently, there are no finalized/promulgated National Emissions Standards for Hazardous Air Pollutants standards for the type of operations used by NorthWestern Energy.

3.4.1 ARSD 74:36:08:39 - ARSD 40 CFR Part 63, Subpart YYYY

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The department reviewed the Maximum Achievable Control Technology (MACT) standards and determined that one MACT standard needs to be reviewed further to determine if it is applicable.

40 CFR Part 63, Subpart YYYY - National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines - is subject to owners or operators of a Stationary Combustion Turbine at a major source of HAP emissions. A major source of HAP emissions is a plant site that emits or has the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAP at a rate of 25 tons or more per year. Based on the potential emission calculations, NorthWestern Energy's potential to emit hazardous air pollutant emissions are less than 10 tons per year of a single hazardous air pollutant and 25 tons per year of any combination of hazardous air pollutants. Therefore, this MACT standard is not applicable to NorthWestern Energy.

As noted in 40 CFR §63.6090(a)(1-3), a stationary combustion turbine is existing if it was constructed on or before January 14, 2003. A new stationary combustion turbine is new if construction commenced after January 14, 2003. A stationary combustion turbine is classified as reconstructed if reconstruction started after January 14, 2003. NorthWestern's generator was installed in 1976; therefore NorthWestern's generator is exempt from this subpart.

3.5 State Requirements

3.5.1 Title V Air Quality Operating Permit

NorthWestern Energy was issued a Title V air quality operating permit in October 1996, because its potential sulfur dioxide and nitrogen oxide emissions were greater than 100 tons per year. NorthWestern Energy's potential sulfur dioxide and nitrogen oxide emissions are still greater than 100 tons per year. In addition, NorthWestern Energy's potential particulate matter is greater than 100 tons per year. Therefore, NorthWestern Energy is still required to maintain a Title V air quality operating permit.

3.5.2 Insignificant Activities

The potential emissions from the tank are less than 2.0 tons per year. In accordance with ARSD 74:36:05:04, a unit with the potential to emit less than two tons or less per year before considering controls is exempt from being included in an air quality permit and is considered an insignificant activity. The potential emission from Tank #1 at NorthWestern Energy's is considered an insignificant activity.

3.5.3 Compliance Assurance Monitoring (CAM)

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from major sources applying for a Title V permit. NorthWestern Energy's renewal application was received on November 25, 2008. Therefore, compliance assurance monitoring is applicable to any unit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;
2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

NorthWestern Energy does not use a control device to achieve compliance with applicable requirements. Therefore, compliance assurance monitoring is not applicable to NorthWestern Energy.

3.5.4 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to Title V of the federal Clean Air Act. NorthWestern Energy is required to meet opacity, particulate and sulfur dioxide emission limits.

Periodic monitoring for the opacity and particulate emission limits may consist of visible emission readings, stack tests, pressure drop readings for the appropriate control device, implementation of a maintenance plan for the appropriate control device, etc. NorthWestern Energy typically operates the combustion turbine less than 100 hours in a calendar year. Therefore, stack testing is not considered economical. NorthWestern Energy will be required to perform periodic visible emission readings when the unit is in operation to ensure the unit can meet its opacity and particulate emission limits. The permit contains sufficient language which allows the department to require NorthWestern Energy to conduct a stack test if visible emission readings or hours of operation warrant a stack test.

Periodic monitoring for sulfur dioxide shall be based on the sulfur content of the distillate oil fired in the combustion turbine.

3.5.5 Air Fees

Title V sources are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants that are charged are particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds and hazardous air pollutants. Presently, the air emission fee is $6.10 per ton of pollutant actually emitted. The actual emissions are calculated by the department and are based on information provided by the source.

3.5.6 State Emission Limits

Total suspended particulate and sulfur dioxide emission limits are applicable to fuel burning units. NorthWestern Energy's operations involve fuel burning units. The total suspended particulate and sulfur dioxide emission limits for fuel burning units are derived from ARSD 74:36:06:02.

Potential emission rates and allowable emissions for each unit were calculated in Appendix B. Tables #2 and #3 compare the potential emission rates to the allowable emission limits for particulate and sulfur dioxide, respectively.

Table #2
Particulate (TSP) Comparison

Unit	Distillate Oil Potential Rate	Particulate Limit
Combustion Turbine	0.06 pounds/million Btu	0.37 pounds/million Btu

Table #3
Sulfur Dioxide Comparison

Unit	Distillate Oil Potential Rate	Sulfur Dioxide Limit
Combustion Turbine	0.2 pounds/million Btu	3.0 pounds/million Btus

3.5.7 State Restrictions on Visible Emissions

Visible emissions are applicable to any unit that discharges to the ambient air. In accordance with ARSD 74:36:12, a facility may not discharge into the ambient air more than 20 percent opacity for all units. NorthWestern Energy must control the opacity at less than 20 percent for the turbine.

3.6 Summary of Applicable Requirements

NorthWestern Energy is required to operate within the requirements stipulated in the following regulations:

ARSD 74:36:05 - Operating Permits for Part 70 Sources;
ARSD 74:36:06 - Regulated Air Pollutant Emissions;
ARSD 74:36:11 - Performance Testing;
ARSD 74:36:12 - Control of Visible Emissions; and

ARSD 74:37:01 - Air Pollution Control Program Fees.

4.0 Recommendation

Based on the information submitted in the air permit renewal application, DENR recommends conditional approval of a Title V air quality operating permit. Any questions pertaining to this permit recommendation should be directed to Keith Gestring, Natural Resources Engineer.

Appendix A

Potential Emission Calculations

NorthWestern Public Service -- Aberdeen

Diesel Engine -- Generator

Given information		Emission Factor			Emission Calculations		
					Formula	Annual Emissions	
Heat Capacity		TSP	0.061	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	111.28	tons TSP/year
416.5	MMBtu/hour	PM-10	0.061	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	111.28	tons PM-10/year
		SO_2	0.26	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	474.9	tons SO_2/year
Potential Operating		NO_X	0.88	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	1605.36	tons NO_X/year
8760	hours/year	VOC	0.00041	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	0.75	tons VOC/year
		HAP	0.00129	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	2.36	tons HAP/year
		CO	0.0033	lbs/MMBtu	(Heat Capacity) x (Emission Factor) x (Potential Operating) / (2000 lb/ton)	6.02	tons CO/year

The heat input for Diesel Engine Generator is based on the Maximum design operating rate of 28800 kilowatts and an estimated operating efficiency of 23.6%.

28800 kilowatts 416.502 MMBtu/hour (28800 kilowatts) x (3413 Btu / hour - killowatts) / (1000000 Btus/MMBtu) / (0.236%)

23.6% Efficiency

Tanks 4.0
Emissions Report – Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification	Tank #1
City	Aberdeen
State	South Dakota
Company	NorthWestern Public Service
Type of Tank	Vertical Fixed Roof Tank
Description	999,950 gallon distillate oil tank

Tank Dimensions

Shell Height (ft)	35.00
Diameter (ft)	70.00
Liquid Height (ft)	34.90
Avg. Liquid Height (ft)	34.00
Volume (gallons)	1,004,718.93
Turnovers	26.00
Net Throughput (gal/yr)	26,122,692.16
Is Tank Heated (y/n)	N

Paint Characteristics

Shell Color/Shade	White/White
Shell Condition	Good
Roof Color/Shade	White/White
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.00

Breather Vent Settings

Vacuum Settings (psig)	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Aberdeen, South Dakota (Avg. Atmospheric Pressure = 14.05 psia)

Tanks 4.0
Emissions Report – Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf Temperature (deg F)			Liquid Bulk Temp. (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fraction	Vapor Mass Fraction	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max		Avg.	Min	Max					
Distillate fuel oil no. 2	All	46.17	39.39	50.96	43.45	0.0039	0.0031	0.0048	130.00			188.00	Option 5 A=12.101, B = 8907

Tanks 4.0
Emissions Report – Summary Format
Individual Tank Emission Totals

Components	Losses (lbs)		
	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	316.82	5.51	322.32

Appendix B

Emission Limit Calculations

Particulate Limit Derivation

Combustion Turbine

Heat Capacity =	416.5	million Btus per hour heat input

The following calculation was performed to determine the particulate limit for the unit

Particulate Limit Formula -- ARSD 74:36:06:02 1(b)

E = 0.811 x H-0.131

where E = the rate of emission in pounds per million Btus of heat input

H = heat input in millions of Btus per hour

E = 0.811 x 416.5^-0.131

E =	**0.368**	**pounds per million Btus of heat input**
or	**153.27**	**pounds per hour**

Distillate Oil Potential Emissions Calculations and Comparison

Potential Emissions for each boiler =	111.280	tons/year
(tons/year) x (2000 lbs/ton) / (8760 hours/year) =	25.406	lbs/hour
(lbs/hour) / (416.5 MMBtu/hour) =	0.061	lbs/MMBtu of heat input

Sulfur Dioxide Limit Derivation

Combustion Turbine

Heat Capacity =	416.5	million Btus per hour heat input per dryer

The following calculation was performed to determine the sulfur dioxide limit for the unit

Sulfur Dioxide Limit Formula -- ARSD 74:36:06:02 2

Emission Limit = 3 pounds per million Btus of heat input

The following calculations was performed to convert potential emissions from (tons/year) to (lbs/MMBtu).

Distillate Oil Potential Emissions Calculations and Comparison

Potential Emissions for each unit =	475	tons/year
(tons/year) x (2000 lbs/ton) / (8760 hours/year) =	108.4	lbs/hour
(lbs/hour) / (416.5 MMBtu/hour) =	0.26	lbs/MMBtu of heat input